Building a Foundation for Achievement

How Early Experiences Shape Brain Architecture and the Skills We Need to Thrive

AL RACE
Deputy Director
Director, Communications and Public Engagement
Center on the Developing Child at Harvard University

NCSL Early Learning Fellows
Denver, CO | May 1, 2013
The Foundation of a Successful Society is Built in Early Childhood

- Educational Achievement
- Economic Productivity
- Responsible Citizenship
- Lifelong Health
- Successful Parenting of Next Generation
- Strong Communities
- Healthy Economy

HEALTHY CHILD DEVELOPMENT

Center on the Developing Child
HARVARD UNIVERSITY
Experiences Build Brain Architecture
The Ability to Change Brains Decreases Over Time

Source: Levitt (2009)

Birth 10 20 30

Physiological “Effort” Required to Enhance Neural Connections

Age (Years)

Normal Brain Plasticity Influenced by Experience

Source: Levitt (2009)

Center on the Developing Child
HARVARD UNIVERSITY
“Serve and Return” Interaction Builds Brain Architecture
Barriers to Educational Achievement Emerge at a Very Young Age

Cumulative Vocabulary (Words)

Child’s Age (Months)

Significant Adversity Impairs Development in the First Three Years

Number of Risk Factors

Source: Barth, et al. (2008)
Toxic Stress Derails Healthy Development
The Biology of Adversity: Three Levels of Stress

**Positive**
Brief increases in heart rate, mild elevations in stress hormone levels.

**Tolerable**
Serious, temporary stress responses, buffered by supportive relationships.

**Toxic**
Prolonged activation of stress response systems in the absence of protective relationships.
Profound Neglect Can Reduce Brain Power

Positive Relationships

Extreme Neglect

Neglect Can Be a Greater Threat to Development than Abuse

- More likely to have anxiety, depression, personality disorders
- More academic problems and special education referrals
- Lower IQ, poorer reading skills, less likely to graduate high school
- Poorer responses to frustrating situations

Source: Egeland, et al. (1983)
Neglect is the Most Prevalent Form of Child Maltreatment

Risk Factors for Adult Depression are Embedded in Adverse Childhood Experiences

Source: Chapman et al, 2004
Biological “Memories” Link Maltreatment in Childhood to Greater Risk of Adult Heart Disease

Source: Danese et al. (2008)
Chronic Diseases Associated With Childhood Adversity Dominate U.S. Health Care Costs

Five of Top Ten Diagnoses for Direct Health Expenditures = $335 billion

Source: Agency for Healthcare Research and Quality (2008)
Early Childhood Policy and Practice: The Current Model

Significant Adversity

Impaired Development

Readiness to Succeed in School

Parenting Education, Sound Nutrition, Stimulating Experiences, and Health-Promoting Environments
Science Points to the Need to *Balance* Enrichment, Prevention, and Protection

- **Significant Adversity**
- **Address Sources and Effects of Toxic Stress**
- **Healthy Developmental Trajectory**
- **Supportive Relationships**, **Stimulating Experiences**, and **Health-Promoting Environments**

Center on the Developing Child | Harvard University
Sources of Toxic Stress in Young Children

- U.S. Children Ages 2-5 (per 1,000):
  - 75 (Maltreatment) - Source: Finkelhor et al. (2005)
  - 130 (Postpartum Depression) - Source: O-Hara & Swain (1996)
  - 136 (Parental Substance Abuse) - Source: SAMHSA (2009)
Instability Disrupts the Stress Response System — But Relationships Reverse the Effect


Center on the Developing Child
HARVARD UNIVERSITY
The Brain Architecture of Memory and Learning
The Brain Architecture of Anxiety and Fear
Higher Childhood [Mystery Skill] Predicts Less Adult Crime

Source: Moffitt, et al. (2011)
Higher Childhood [Mystery Skill] Predicts Better Adult Health

Source: Moffitt, et al. (2011)
Higher Childhood **Self-Control** Predicts Greater Adult Wealth

Source: Moffitt, et al. (2011)
The Pencil Tap Test

Source: Blair, C. (2012)
An “Air Traffic Control System” in the Brain

Executive functioning is a group of skills that help us to focus on multiple streams of information at the same time, set goals and make plans, make decisions in light of available information, revise plans, and resist hasty actions.

- A key biological foundation of school readiness as well as outcomes in health and employability.
Three Types of Executive Function Skills

**Inhibitory Control** — filter thoughts and impulses to resist temptations and distractions

**Working Memory** — hold and manipulate information in our heads over short periods of time

**Mental flexibility** — adjust to changed demands, priorities, or perspectives
What Do These Skills Look Like in Adults?

**Inhibitory Control** — filter thoughts and impulses to resist temptations and distractions

**Working Memory** — hold and manipulate information in our heads over short periods of time

**Mental Flexibility** — adjust to changed demands, priorities, or perspectives
How Does Executive Function Develop?
Circuits for Executive Function Skills Are Located in Brain Regions that Exhibit an Extended Period of Plasticity

Weintraub, et al., (2011)
How Executive Function Is Being Applied Across Multiple Agencies in WA

**Economic Services Administration**  
WorkFirst assessment redesign

**Juvenile Rehabilitation Administration**  
Building adolescent executive function through mindfulness training

**Training for Managers**  
mid-level managers in Economic Services, Vocational Rehabilitation, Children’s Administration, Aging & Disability Services

**Medicaid**  
Incorporate EF information into contractually obligated training for managed care organizations

**Public Health**  
Tobacco cessation program  
Consultation with local health jurisdictions
WA Department of Early Learning

Professional Development
Guidelines, online modules, coaching, learning communities

Assessment
Consultation with researchers on using NIH Toolbox EF assessment tools

Pilot Sites
Childhaven (therapeutic child care) and Children’s Home Society (Head Start, EHS, home visiting, foster care)

Co-creation and weekly collaboration with researchers: initial focus on games

Building EF capacities in children and caregivers combined with strategies for reducing toxic stress in families

Center on the Developing Child  HARVARD UNIVERSITY
WA Early Learning Guidelines

Working memory

Remember and follow directions in one or two steps.

— 3-4 years

Listen to others and respond in a group discussion for a short period. Remember what was said and gain information through listening.

— 4-5 years

http://www.del.wa.gov/development/guidelines/
Inhibitory Control

Enjoy turn-taking games with caregivers and may direct adult in his or her role.

—16-36 months

Will sometimes turn down a treat now if a better treat will be available later (one cookie now or two cookies later).

—3-4 years
Cognitive/Mental Flexibility

Adjust behavior to different settings (such as using an outdoor or an indoor voice), sometimes with reminders. —4-5 years

Begin to enjoy games like Simon Says, where a child has to adjust behavior in response to changing rules. —4-5 years

http://www.del.wa.gov/development/guidelines/
Del Professional Development Module

http://www.deltraining.com/courses/Executive_Function/content-frame.htm
What Is Inhibitory Control?
How Can Early Learning Practitioners Support its Development?
## Supporting the Development of EF Skills

<table>
<thead>
<tr>
<th>Supporters</th>
<th>Strategies</th>
<th>Capacities</th>
<th>Skills</th>
<th>Life Course Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents, Caregivers, Teachers &amp; Other Professionals</td>
<td>Address external causes of stress</td>
<td>Working Memory</td>
<td>Remember</td>
<td>Learning &amp; Work</td>
</tr>
<tr>
<td>Support</td>
<td>Teach &amp; use stress coping techniques</td>
<td>Flexibility</td>
<td>Filter</td>
<td>✓ Follow multi-step instructions</td>
</tr>
<tr>
<td>Model</td>
<td>Foster social interaction</td>
<td>Self-control</td>
<td>Focus</td>
<td>✓ Avoid distractions</td>
</tr>
<tr>
<td>Engage</td>
<td>Encourage physical exercise</td>
<td>Range</td>
<td>Plan</td>
<td>✓ Plan &amp; execute</td>
</tr>
<tr>
<td>Be Reliable</td>
<td>Progressively increase complexity</td>
<td></td>
<td>Monitor</td>
<td>✓ Manage long-term assignments</td>
</tr>
<tr>
<td>Guide</td>
<td>Practice, practice, practice</td>
<td></td>
<td>Adjust</td>
<td>✓ Adjust to new rules</td>
</tr>
<tr>
<td>Protect</td>
<td></td>
<td></td>
<td>Resist</td>
<td>✓ Seek alternate solutions</td>
</tr>
<tr>
<td>Environments</td>
<td></td>
<td></td>
<td>Persevere</td>
<td></td>
</tr>
<tr>
<td>Safe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creative</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explorable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; Economically</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; Emotionally</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Diamond, et al. (2011)
How Executive Function Is Being Applied Across Multiple Agencies in WA

**Economic Services Administration**
WorkFirst assessment redesign

**Juvenile Rehabilitation Administration**
Building adolescent executive function through mindfulness training

**Training for Managers**
mid-level managers in Economic Services, Vocational Rehabilitation, Children’s Administration, Aging & Disability Services

**Medicaid**
Incorporate EF information into contractually obligated training for managed care organizations

**Public Health**
Tobacco cessation program
Consultation with local health jurisdictions